

PROPOSED LWG APPROACH FOR ANALYZING POTENTIAL ADVECTIVE LOADING FROM SUBSURFACE SEDIMENT TO SURFACE SEDIMENT

GOALS OF THE ANALYSIS

- Develop order-of-magnitude estimates of chemical loading due to desorption from subsurface sediments and advective transport to surface sediments
- Support development of the conceptual site model and the abiotic fate and transport (AFT) model
- Provide general information for remedy selection including the relative importance of this pathway compared to other fate and transport pathways and which constituents and concentrations may be significant.

CONCEPTUALIZATION ISSUES AND KEY ASSUMPTIONS

- Upward flux of chemicals from subsurface sediments due to desorption and advection can increase chemical concentrations in surface sediments if surface bulk sediment concentrations (OC-normalized) are initially lower than the underlying subsurface interval. If surface concentrations are greater than or equal to subsurface concentrations, mass flux from the subsurface will not accumulate in surface sediments but will instead discharge to overlying surface water. It is assumed that the existing estimates of advective flux from surface sediments to surface water are inclusive of the latter phenomenon. Therefore, the scope of this analysis is restricted to locations in the Study Area where relatively cleaner over relatively dirtier conditions exist.
- It is assumed that subsurface loads are instantaneously mixed vertically over the 30-cm surface mixed sediment layer. This is consistent with the AFT model assumptions for other load types and is reasonable given the relatively short time scale of sediment mixing in the surface mixed layer based on empirical estimates from the time-series bathymetry dataset.
- It is assumed that surface sediment concentrations will increase at a constant rate until surface sediment concentrations reach equilibrium with porewater concentrations advecting from subsurface to surface sediments. This conservatively assumes that an infinite source of chemical exists in the subsurface.
- Advective transport with equilibrium adsorption/desorption are the only transport process considered in this analysis. Several processes that could affect chemical accumulation in surface sediments (i.e., dispersion, degradation/transformation, and sediment transport) are not considered. Changes in the geochemical conditions are assumed to be minimal.

OVERALL APPROACH

- Estimate subsurface pore water concentrations based on equilibrium partitioning assumptions
- Estimate subsurface chemical mass flux to surface sediments by multiplying estimated pore water concentrations by the estimated groundwater advection rate
- Express chemical mass fluxes in terms of a rate of chemical accumulation (i.e., a rate of concentration increase) in surface sediments and a time to reach equilibrium with surface sediments that are assumed to be initially clean.
- Decision point: If subsurface loads are not sufficient to increase average surface concentrations significantly over a reasonable timeframe (e.g., 30 years), then subsurface loads will not be further evaluated in the fate and transport model. If loads are significant relative to loads from other fate and transport processes and screening levels, then proceed to developing estimates of subsurface loads to AFT model cells. (GIS will be used to determine the fraction of each model cell where conditions exist for subsurface loads to increase surface concentrations, a SWAC for subsurface sediments in the relevant of the model cell will be generated as a basis for estimating the pore water concentration term, and loads to the relevant fraction of the model cell will be calculated.)

DATA SELECTION AND DATA PROCESSING

1. Data
 - RI Nature and Extent Data Set, which includes SCRA Cat1 QA2 and Cat 1 QA1 sediment data
 - RM 1 – RM 11.8, including the upstream end of Multnomah Channel
 - RI summation method
 - Set all ND = 0
 - Use literature K_{oc} values compiled in Table D4-4 of the Round 2 Report.
2. Analyte list: indicator chemical list for the RI/FS equilibrium partitioning evaluation (currently under development)